# Appendix 2 Graphical Representation – Tracing Between Existing and Proposed § 25.1329 Paragraphs

## Existing Paragraphs

(a) Each automatic pilot system must be approved and must be designed so that the automatic pilot can be quickly and positively disengaged by the pilots to prevent it from interfering with their control of the airplane.

- (b) Unless there is automatic synchronization, each system must have a means to readily indicate to the pilot the alignment of the actuating device in relation to the control system it operates.
- (c) Each manually operated control for the system must be readily accessible to the pilots.
- (d) Quick release (emergency) controls must be on both control wheels, on the side of each wheel opposite the throttles.

## Proposed Paragraphs

(a) Quick disengagement controls for the autopilot and autothrust functions must be provided for each pilot. The autopilot quick disengagement controls must be located on both control wheels (or equivalent). The autothrust quick disengagement controls must be located on the thrust control levers. Quick disengagement controls must be readily accessible to each pilot while operating the control wheel (or equivalent) and thrust control levers.

## Autothrust requirements are new.

(b) The effects of a failure of the system to disengage the autopilot or autothrust functions when manually commanded by the pilot shall be assessed in accordance with the requirements of § 25.1309.

#### NEW

(c) thru (e), below, introduce NEW requirements related to <u>transients</u>. These are somewhat related to the intent of the current 25.1329(b)

- (c) Engagement or switching of the flight guidance system, a mode, or a sensor must not produce a significant transient response affecting the control of flight patch of the airplane.
- (d) Under normal conditions, disengagement of automatic control functions of a flight guidance system must not produce any significant transient response affecting the control or flight path of the airplane, nor require a significant force to be applied by the pilot to maintain the desired flight path.
- (e) Under other than normal conditions, transients affecting the control or flight path of the airplane resulting from the disengagement of any automatic control functions of a Flight Guidance System shall not require exceptional piloting skill or strength to remain within, or recover to, the normal flight envelope.

- (e) Attitude controls must operate in the plane and sense of motion specified in Sec. 25.777 (b) and Sec. 25.779(a) for cockpit controls. The direction of motion must be plainly indicated on, or adjacent to, each control.
- (f) The system must be designed and adjusted so that, within the range of adjustment available to the human pilot, it cannot produce hazardous loads on the airplane, or create hazardous deviations in the flight path, under any condition of flight appropriate to its use either during normal operation, or in the event of a malfunction, assuming that corrective action begins within a reasonable period of time.
- (g) If the automatic pilot integrates signals from auxiliary controls or furnishes signals for operation of other equipment, there must be positive interlocks and sequencing of engagement to prevent improper operation. Protection against adverse interaction of integrated components, resulting from a malfunction, is also required.
- (h) If the automatic pilot system can be coupled to airborne navigation equipment, means must be provided to indicate to the flight crew the current mode of operation. Selector switch position is not acceptable as a means of indication.

JAR 25.1329(I)

[(i) A warning must be provided to each pilot in the event of automatic or manual disengagement of the automatic pilot. (See JAR 25.1322 and its AMJ.)]

- (f) Command reference controls (e.g., heading select, vertical speed) must operate consistently with the criteria specified in §§ 25.777(b) and 25.779(a) for cockpit controls. The function and direction of motion of each control must be plainly indicated on, or adjacent to, each control if necessary to prevent inappropriate use or confusion.
- (g) Under any condition of flight appropriate to its use, the Flight Guidance System must not:
  - produce unacceptable loads on the airplane (in accordance with § 25.302), or
  - create hazardous deviations in the flight path.

This applies to both fault-free operation and in the event of a malfunction, and assumes that the pilot begins corrective action within a reasonable period of time.

(h) When the flight guidance system is in use, a means shall be provided to avoid excursions beyond an acceptable margin from the speed range of the normal flight envelope. If the aircraft experiences an excursion outside this range, the flight guidance system must not provide guidance or control to an unsafe speed.

### NEW

- (i) The FGS functions, controls, indications, and alerts must be designed to minimize flight crew errors and confusion concerning the behavior and operation of the FGS. Means must be provided to indicate the current mode of operation, including any armed modes, transitions, and reversions. Selector switch position is not an acceptable means of indication. The controls and indications must be grouped and presented in a logical and consistent manner. The indications must be visible to each pilot under all expected lighting conditions.
- j) Following disengagement of the autopilot, a visual and aural warning must be provided to each pilot and be timely and distinct from all other cockpit warnings

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(k) Following disengagement of the autothrust function, a caution must be provided to each pilot.

## NEW

(I) The autopilot must not create an unsafe condition when the flight crew applies an <u>override</u> force to the flight controls.

## NEW

(m) During autothrust operation, it must be possible for the flight crew to move the thrust levers without requiring excessive force. The autothrust response to flight crew override must not create an unsafe condition.

## **NEW**